

REMARKS

In the June 29, 2006 final Office Action, claims 1, 36, 37, 47 and 48 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,826,971 to Hirose ("Hirose '971"). Claims 38, 41 and 44 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hirose '971 in view of U.S. Patent No. 5,825,035 to Mizumura. Claims 39, 42 and 45 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hirose '971 in view of Mizumura and further in view of U.S. Patent No. 5,783,830 to Hirose ("Hirose '830"). Claims 40, 43 and 46 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hirose '971.

Applicants respectfully traverse the prior art rejections of claims 1 and 36-48. As set forth in detail below, the combined teachings of the references do not disclose or suggest the combination of steps recited in claims 1 and 36-48. Applicants therefore request reconsideration of their application without further amendment to the claims.

The present invention relates to a method of preparing a sample chip and observing a wall surface of the sample chip.

Various conventional techniques for forming a sample chip and observing a surface of the sample chip are known. For example, as described in the specification (pgs. 1-3), the conventional techniques are complex and

expensive to carry out. Additionally, the conventional techniques do not generate sufficient resolution for adequate observation of the surface of the sample chip. As a result, a comprehensive analysis of the sample chip (e.g., observation of the geometry of the surface of the sample chip) cannot be performed with the conventional techniques.

The present invention overcomes the drawbacks of the conventional art. With reference to the embodiment shown in Figs. 1A-1H, for example, a method of preparing a sample chip and observing a wall surface thereof according to the invention comprises a first step of etching a preselected portion of a sample and an area surrounding the preselected portion of the sample by irradiating the sample with a focused ion beam 2 to form a sample chip 1. Preferably, when the sample has a multi-layered structure made of different materials, a wall surface of the sample chip is gas-assist-etched during irradiation with the focused ion beam 2 so that the wall surface is formed with stepped portions due to differences in the materials of the multi-layered structure of the sample. Thereafter, in a second step, the sample chip is taken out from the sample. In a third step, the wall surface of the sample chip is observed with a scanning probe microscope. By this method, the geometry of the surface of the sample chip and its three-dimensional distribution thereof can be observed with an atomic level resolution.

**Rejection of Claims 1, 36, 37,
47 and 48 Under 35 U.S.C. §102(e)**

Applicants respectfully traverse the rejection of claims 1, 36, 37, 47 and 48 as being anticipated by Hirose '971.

Independent Claim 1

Applicants respectfully submit that Hirose '971 does not disclose or suggest the method recited in independent claim 1, including the formation of a wall surface formed with stepped portions and the subsequent step of observing the wall surface formed with the stepped portions.

In the Office Action (pg. 13), the Examiner contends that Hirose '971 discloses a sample chip 2 having a wall surface formed with a stepped portion 23 (Fig. 8). Applicants respectfully traverse this contention. However, even if the element denoted by reference numeral 23 in Fig. 8 of Hirose '971 is broadly interpreted as a stepped portion formed on a wall surface (i.e., the top wall surface) of the sample chip 2, this interpretation does not meet the explicit limitations of claim 1.

More specifically, claim 1 recites a first step of etching a preselected portion of a sample and an area surrounding the preselected portion of the sample by irradiating the sample with a focused ion beam to form a sample chip having a wall surface formed with stepped

portions. Thus claim 1 requires the formation of a sample chip having a wall surface formed with stepped portions by an etching step which requires irradiating the sample with a focused ion beam. Stated otherwise, claim 1 requires that the sample chip and corresponding stepped portions on the wall surface thereof are formed during this first step by irradiation of the sample with a focused ion beam.

In contrast, the element denoted by reference numeral 23 in Hirose '971 is a tungsten film which does not correspond, to nor is it in the form of, a stepped portion. The Tungsten film 23 is formed for the purpose of adhering a microprober 22 to the top wall of the sample chip 2 so that the sample chip 2 can be detached from an element formation portion 53 (Figs. 8-9; col. 4, line 63 to col. 5, line 4). The tungsten film 23 is formed after the formation of the sample chip 2 which is illustrated in Fig. 7. Stated otherwise, the tungsten film 23 in Hirose '971 is not formed during the formation of the sample chip 2 by irradiation of a focused ion beam 21 (col. 4, lines 60-63).

Claim 1 further recites a third step of observing the wall surface (i.e., the surface formed with the stepped portions) of the sample chip with a scanning probe microscope. While Hirose '971 discloses a step of analyzing the sample chip 2, such analysis step does not correspond to the observation step recited in claim 1. More specifically,

Hirose '971 discloses that after extraction from the formation portion 53, the sample chip 2 is secured to a supporting base 25 where it undergoes analysis (col. 5, lines 18-20).

However, the analysis is conducted after the microprober 22 and corresponding tungsten film 23 are removed (col. 5, lines 21-23). Thus, in Hirose '971 the analysis of the sample chip 2 is not conducted while the tungsten film 23 is formed or protrudes from the top wall of the sample chip 2. In contrast, claim 1 recites the step of observing the sample chip wall surface formed with the stepped portions (i.e., the stepped portions formed on the wall surface are present during the observation step).

Independent Claim 47 and Dependent Claim 48

Independent claim 47 is directed to a method of preparing a sample chip and observing a wall surface thereof and requires the steps of providing a sample having a multi-layered structure made of different materials, irradiating the sample with a focused energy beam to form a sample chip while a wall surface of the sample chip is gas-assist-etched so that the wall surface is formed with stepped portions due to differences in the materials of the multi-layered structure of the sample, taking out the sample chip from the sample, and observing the wall surface of the sample chip having the stepped portions with a scanning probe microscope. No

corresponding combination of steps is disclosed or suggested by Hirose '971.

Contrary to the Examiner's contention in the final Office Action (pg. 4), the tungsten film 23 in Hirose '971 does not correspond to, nor is it in the form of, a stepped portion as set forth above for independent claim 1. In this regard, the tungsten film 23 in Hirose '971 is formed by depositing tungsten, not by etching a wall surface of a sample chip, as recited in claim 47.

Furthermore, claim 47 recites that the wall surface is formed with stepped portions due to differences in the materials of the multi-layered structure of the sample. Thus, even if the tungsten film 23 were interpreted as forming a stepped portion on a surface of a sample chip, Hirose '971 discloses that the formation of such stepped portion results from depositing tungsten on the surface of the sample chip, not due to differences in materials of a sample having a multi-layered structure, as required by claim 47.

Moreover, Hirose '971 does not disclose or suggest the step of observing the wall surface of the sample chip having the stepped portions with a scanning probe microscope, as recited in claim 47, as set forth above for the third step recited in independent claim 1.

Claim 48 depends on and contains all of the limitations of independent claim 47 and, therefore, distinguishes from Hirose '971 at least in the same manner as claim 47.

Independent Claim 36 and Dependent Claim 37

Independent claim 36 also recites a combination of steps that is not disclosed or suggested by Hirose '971, including the formation of a sample chip by irradiating a sample with a first focused energy beam and the subsequent irradiation of a wall surface of the sample chip with a second focused energy beam prior to observation of the wall surface with a scanning probe microscope. While disclosing that a second focused energy is irradiated on a top portion of the sample chip, Hirose '971 does not disclose or suggest the irradiation of a wall surface of the sample chip with a second focused energy beam, as recited in claim 36.

Claim 37 depends on and contains all of the limitations of independent claim 36 and, therefore, distinguishes from Hirose '971 at least in the same manner as claim 37.

Moreover, there is a separate ground for patentability of dependent claim 37 which includes the additional limitation that the second step further comprises the step of securing the sample chip to a sample chip holder after the sample chip is picked-up from the sample so that the

wall surface of the sample chip etched in the third step and observed in the fourth step faces in an upward direction. No corresponding step is disclosed or suggested by Hirose '971.

In view of the foregoing, applicants respectfully request that the rejection of claims 1, 36, 37, 47 and 48 under 35 U.S.C. §102(e) as being anticipated by Hirose '971 be withdrawn.

Rejection of Claims 38-46
Under 35 U.S.C. §103(a)

Applicants respectfully traverse the prior art rejections of claims 38-45 based on the teachings of Hirose '971, Mizumura, and Hirose '830.

Independent Claims 40 and 43

Independent claims 40 and 43 are directed to a method of preparing a sample chip and observing a wall surface thereof. Each of independent claims 40 and 43 recites a combination of steps that is not disclosed or suggested by the prior art of record, including the formation of a sample chip by irradiating a sample with a first focused energy beam and the subsequent irradiation of a wall surface of the sample chip with a second focused energy beam prior to observation of the wall surface with a scanning probe microscope. No corresponding combination of steps is disclosed or suggested by Hirose '971 as set forth above for independent claim 36.

Dependent Claims 38, 39, 41, 42, and 44-46

Claims 38-39, 41-42 and 44-46 depend on and contain all of the limitations of independent claims 36, 40 and 43, respectively, and, therefore, distinguish from the prior art of record at least in the same manner as claims 36, 40 and 43.

Moreover, there are separate grounds for patentability of dependent claims 39, 42 and 45 which are directed to the formation of stepped portions in the wall surface of the sample chip. No corresponding step is disclosed or suggested by the prior art of record as set forth above for independent claim 1.

In view of the foregoing, applicants respectfully request that the rejections of claims 38-46 under 35 U.S.C. §103(a) be withdrawn.

In view of the foregoing, applicants respectfully submit that claims 1 and 36-48 patentably distinguish over the prior art. Accordingly, favorable reconsideration and withdrawal of the prior art rejections together with passage of the application to issue are respectfully requested.

Respectfully submitted,

ADAMS & WILKS
Attorneys for Applicants

By: 
Bruce L. Adams
Reg. No. 25,386

17 Battery Place
Suite 1231
New York, NY 10004
(212) 809-3700

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Thomas Tolve

Name



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NOVEMBER 28, 2006

Date